PART III

Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have imp roved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan De Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hills country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland which has been glaciated and occupied by the sea in the lowest section. The cintinental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High, isolated volcanic cones of lava such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 3,000 and 10,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hills from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems build since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River Gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

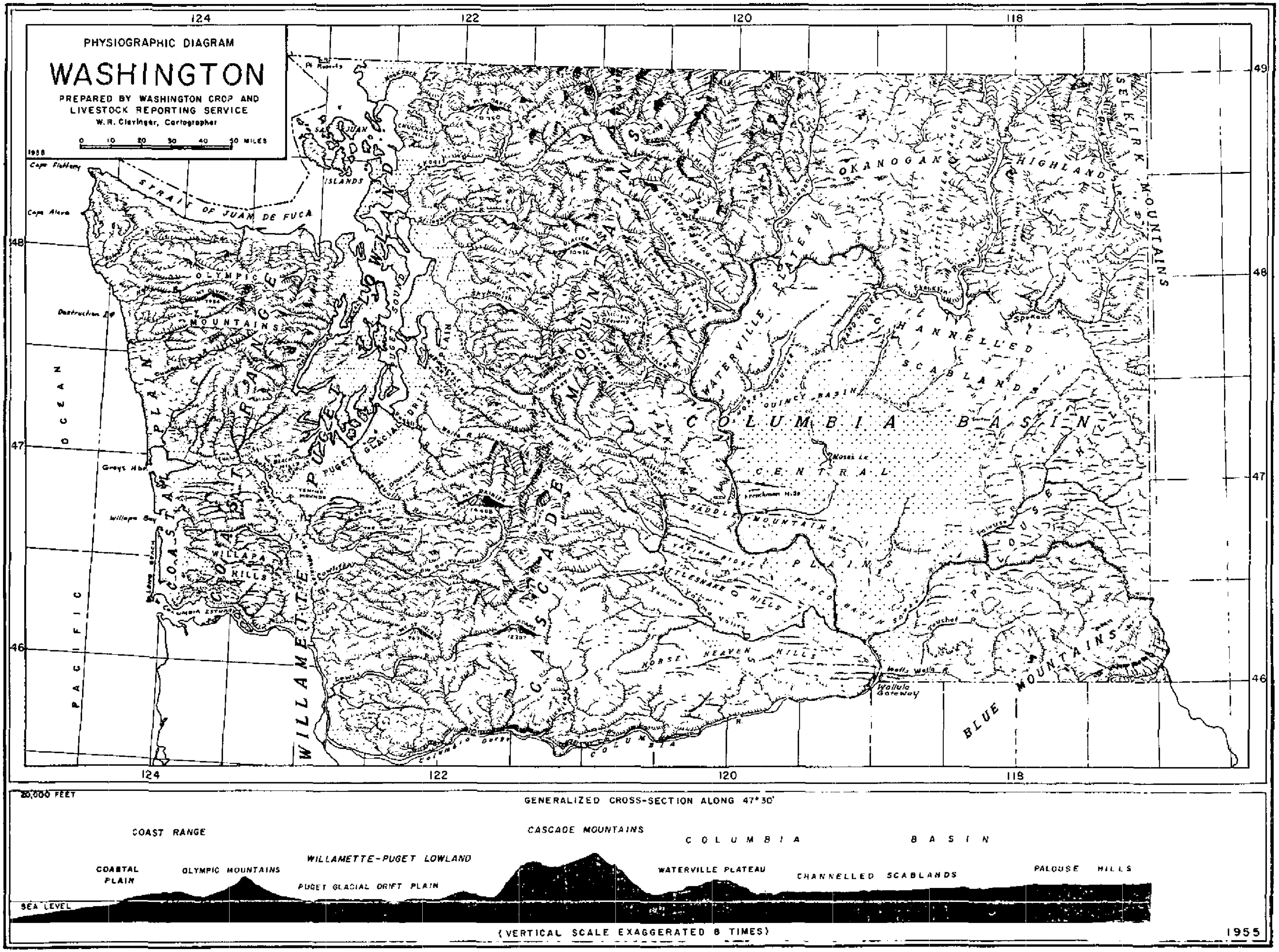
Blue Mountains

The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

Topography of Columbia County

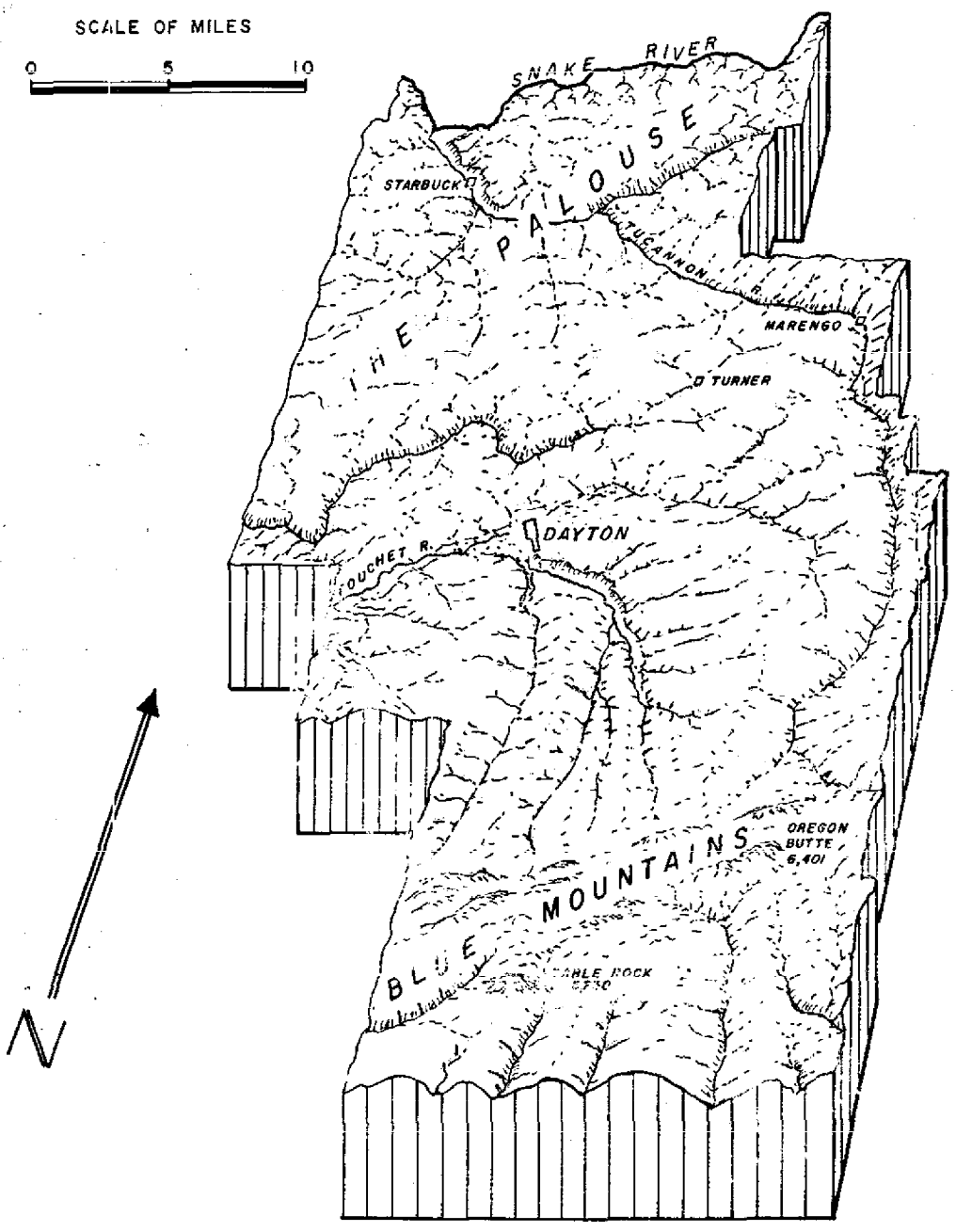
The topography of Columbia County consists of two general regions--a low, hilly plateau interspersed with narrow valleys in the north and a rough, mountainous portion of the Blue Mountains in the south. The northern region is part of the Palouse Hills formation of wind-deposited soils lying on basalt rock beds. The hills and ridges are of 1,000 to 1,800 feet in elevation and most are of gentle contours permitting cultivation. This hilly plateau is eroded by the Snake River which has cut a deep canyon across it from east to west. The Tucannon and Touchet Rivers with narrow, flat valley bottom lands also dissect the hill formation. There are numerous dry gulleys cut by intermittent streams. The Snake River canyon rises sharply from elevations of 500 to 600 feet on its principal bars such as Revere and New York Bars to the plateau rims above them at 1,000 to 1,400 feet. The lowest part of Columbia County is 480 feet on the high water benchline of the Snake River where it passes westward into Walla Walla and Franklin Counties. Principal towns are located on the valley floors. Starbuck is on the lower Tucannon flats at 645 feet elevation. Dayton is on the valley floor of the Upper Touchet River at 1,613 feet.

The Blue Mountain region in the south rises abruptly from the more gentle hills south of Dayton. Numerous mountain tributaries of the Touchet and Tucannon Rivers have eroded the plateau into narrow valleys and steep ridges. The main divide of the Blue Mountains passes through southern Columbia County and its elevations range from the county's highest point of 6,400 feet on Oregon Butte at the head of the Tucannon to 6,250 feet on Table Rock at the source of the Touchet, Walla Walla and Grande Ronde Rivers. Most of the mountain region above 4,000 feet is a pine forest under federal management in Umatilla National Forest.


PHYSIOGRAPHIC DIAGRAM
WASHINGTON
PREPARED BY WASHINGTON CROP AND LIVESTOCK REPORTING SERVICE
W. R. Clevinger, Cartographer
0 10 20 30 40 50 MILES
1955
124
122
120
118
49
48
47
46
SELKIRK MOUNTAINS
HIGHLAND
OKANOGAN
STRAIT OF JUAN DE FUCA
ISLANDS
OLYMPIC MOUNTAINS
COAST RANGE
CASCADE MOUNTAINS
PUGET LOWLAND
WILLAMETTE
COAST
WILLAPA HILLS
WATERVILLE PLATEAU
CHANNELLED SCABLANDS
COLUMBIA BASIN
CENTRAL PLAINS
SADDLE MOUNTAINS
RATTLESNAKE HILLS
PASCO BASIN
HORSE HEAVEN HILLS
PALOUSE HILLS
BLUE MOUNTAINS
Wallula Gateway
Cape Flattery
Cape Alava
Destruction Id
Grays Hbr
Willapa Bay
OCEAN
PACIFIC
QUINCY BASIN
Columbia Gorge
COLUMBIA R.
GENERALIZED CROSS-SECTION ALONG 47° 30'
20,000 FEET
SEA LEVEL
COAST RANGE
COASTAL PLAIN
OLYMPIC MOUNTAINS
WILLAMETTE-PUGET LOWLAND
PUGET GLACIAL DRIFT PLAIN
CASCADE MOUNTAINS
COLUMBIA BASIN
WATERVILLE PLATEAU
CHANNELLED SCABLANDS
PALOUSE HILLS
(VERTICAL SCALE EXAGGERATED 8 TIMES)
1955

TOPOGRAPHIC DIAGRAM

COLUMBIA COUNTY



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W. R. CLEVINGER.

Land Classification and Soils

Columbia County land is boardly divided into seven general classes. About 60 percent of the county area is classified as good to fair Class I, II, III and IV lands suited for growing dryland and irrigated crops of grain, green peas and alfalfa and tree crops. A large area of Blue Mountain terrain in southern Columbia County reduces the available amount of cropland.

Soils have not been analyzed and mapped in detail. A general reconnaissance soil map shows that Columbia County's main agricultural areas contain two major and productive soil series common to southeastern Washington. 1/

The Palouse soil series, noted as a wheat and pea producing soil belt of eastern Washington, extends across northern Columbia County. It makes up the Class I, II and III lands of the rolling hills and plateau plains in the Touchet and Tucannon River basins. Palouse soil is a loess or wind deposited soil formed under low rainfall conditions and under bunch grassland. It is a fine silt loam, deep and easily cultivatable, rich in essential minerals and highly retentive of moisture. Wheat, barley, peas and alfalfa yield well on this soil. The Class I and II lands of the Touchet Valley and Dayton area are mostly Palouse soils. Deposits are found also in the upper Tucannon Valley. Over 20,000 acres contain the rich Palouse soils.

Ritzville series is another wind-deposited soil located in the northeastern corner of Columbia County on the low hills and ridges of the lower Tucannon Valley. This soil is a fine silt loam formed under a low rainfall of about 10-12 inches per year. Main use of this soil is for wheat and barley using the summer fallow system. It is rich in minerals and retentive of moisture and comprises over 10,000 acres of Class I and II land.

A soil series termed the Snake is located in the valley lowlands of the Touchet and Tucannon and Snake Rivers. It is a sandy, gravelly soil deposited by stream action along the lower terraces and flood plains of the rivers. It is used for irrigation agriculture growing alfalfa, asparagus and other vegetables and comprises an important belt of Class I and II soils in the Whetstone Hollow branch valley of the upper Touchet River.

The less productive mountain or rocky soils making up Class V, VI and VII lands of Columbia County are the sloping benchlands, gullies and rock outcrop areas near the Snake River and the rough terrain of the Blue Mountain range. These general areas are used for grazing under permit of the Commission of Public Lands, State of Washington and the Umatilla National Forest of the U. S. Forest Service. The higher portion of the Blue Mountains is under permanent forest management.

1/ U. S. Department of Agriculture. Atlas of American Agriculture, 1936. pp. 80-81. Map plate pages 28-30 of soils of Pacific Northwest. See also Otis W. Freeman, Howard H. Martin, The Pacific Northwest an Overall Appreciation, 1954. pp. 124-127.

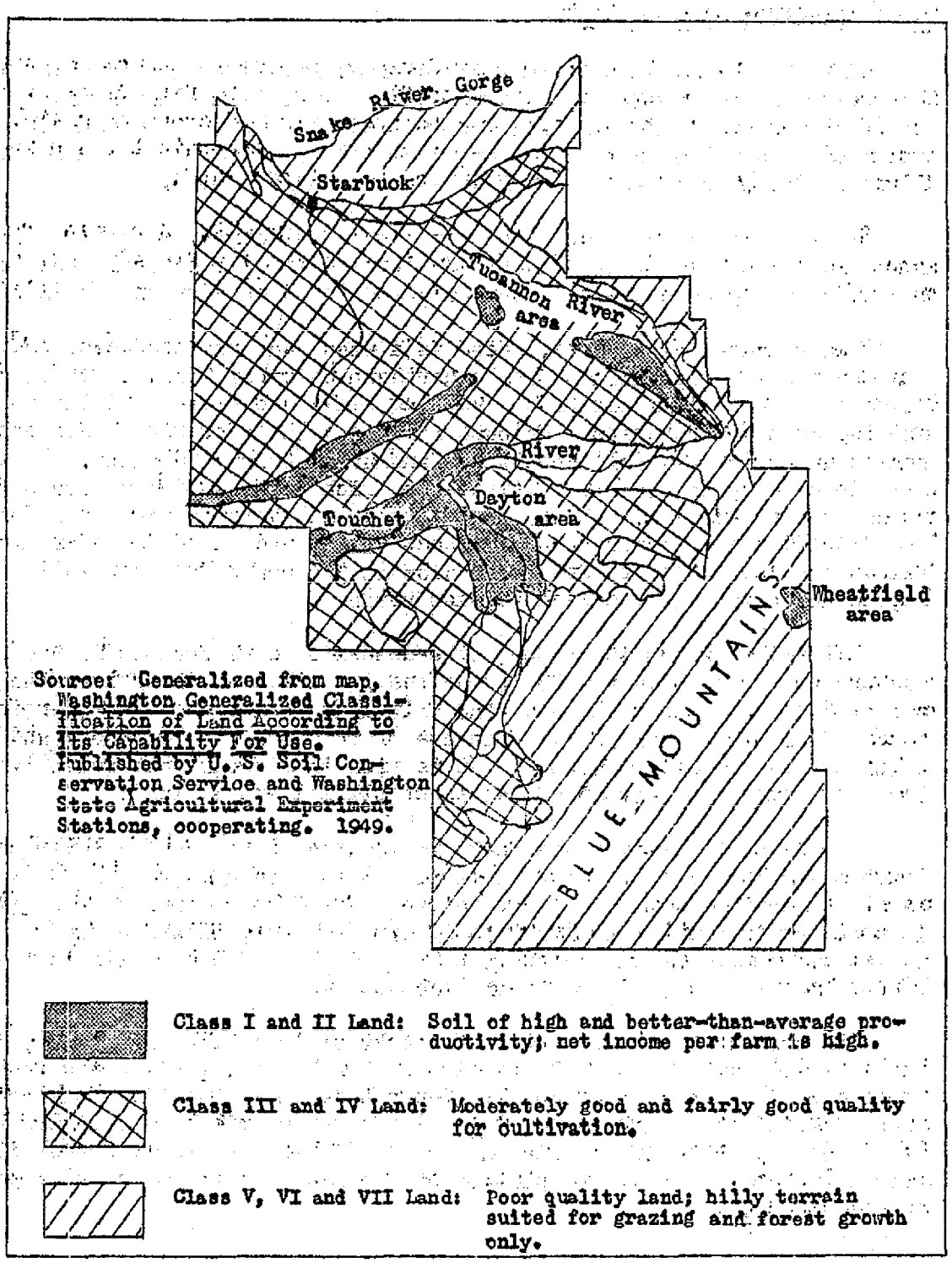

Figure 5.- General Quality of Land in Columbia County

Climate

Climatic conditions vary from north to south with changes in elevation. With the exception of the Blue Mountain area in the southern half of the area, Columbia County has the dry continental climate which extends from the Cascades

eastward to the ranges of the Rocky Mountains. The Blue Mountains have a local highland climate which is cooler and more humid than the Columbia River and Snake River lowlands surrounding it. Columbia County agriculture is mainly within the lowland continental climate region where summers are hot and dry and the winters are moderately humid and cool. Because of its uneven topography, temperature and rainfall average conditions vary sharply within short distances within Columbia County. Field crops are adapted to a range of temperatures and growing seasons which are associated with transitions in elevations from 650 feet to over 3,000 feet in some wheat growing districts in the higher foothills. Some farms have croplands within them that have differences of over 1,000 feet from lowest to highest fields.

Precipitation varies from about 8 inches at Starbuck in the lower Tucannon Valley and in the Snake River canyon to 40 inches and more in the higher Blue Mountains. In the primary crop growing belt through the central portion of the county, precipitation ranges from 12 to 20 inches. Dayton has a weather station which has recorded an average of 19.58 inches per year. North of Dayton conditions are dry and grain and pea crops are grown under the summer fallow system to accumulate top soil moisture. Most grains are sown in the fall to take advantage of winter rainfall and protective snow cover. Most precipitation comes in the winter months. Summers are generally dry in the lowlands but heavy thunderstorm showers occur in the Blue Mountain region with regularity. Westerly winds from the Pacific drop considerable moisture as they rise over the Blue Mountains. They bring moderately heavy snowfall to most of the county during midwinter. Snowfall protects winter wheat and barley sprouts from freezing.

Table 6.- Precipitation at Dayton, Columbia County, By Months

Station and Elevation in Feet	Average Monthly Precipitation (in inches)												Annual Total (inches)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Dayton (1,610)	2.39	1.92	2.15	1.57	1.40	1.55	.46	.27	.81	1.92	2.42	2.72	19.58

Source: U. S. Weather Bureau, Climatological Data, Washington, Annual Summary, 1956

Temperatures recorded in the agricultural area surrounding Dayton average slightly above freezing in midwinter and reach an average of about 70 degrees in midsummer. Temperature averages are slightly warmer in the lowlands of the Tucannon Valley north of Dayton, but are more severe in the winter in the higher lands of the Blue Mountains. During the midsummer growing season Weather Bureau observations show that at Dayton temperatures are in the 80's and 90's during midday and about 60 to 65 at night.

Records at Dayton over a period of several years show that temperature extremes occur and that the growing season is about 165 days long at that locality. Dayton is at 1,610 feet elevation and other localities in Columbia County of higher or lower elevations will vary from this. In the Touchet Valley region at Dayton, temperatures as cold as 22 degrees below zero and as high as 109 have been recorded. In this locality the last killing frost of spring comes about May 1 and the first in autumn is in mid-October.

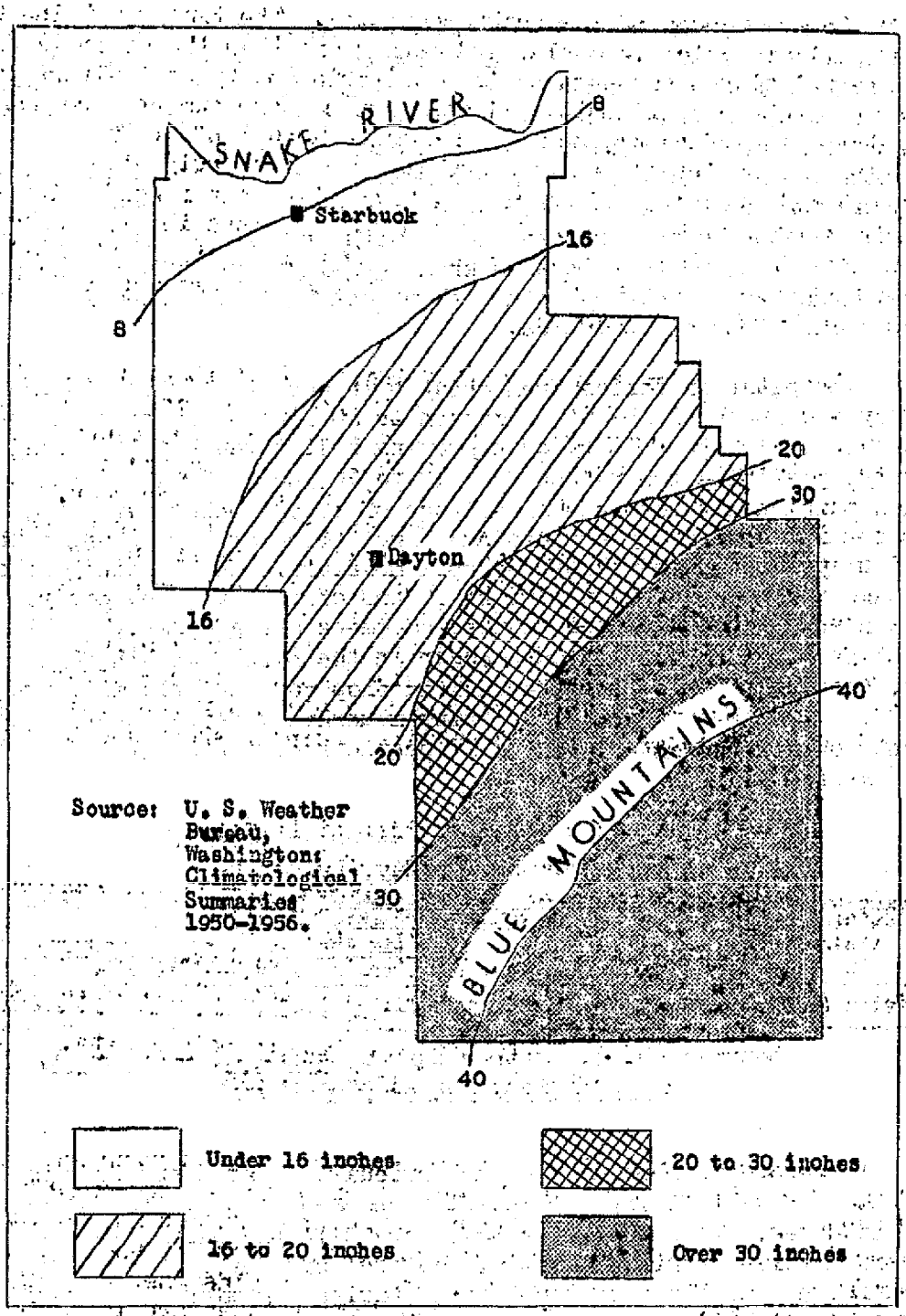

Figure 6.- Distribution of Precipitation
Columbia County

Table 7.- Temperature Extremes, Dates of Killing Frost
Columbia County

Station and Elevation in Feet	Temperature Extremes Recorded (degrees Fahrenheit)		Killing Frost Average Dates	
	Coldest	Hottest	Last in Spring	First in Fall
Dayton (1,610)	-22	109	May 2	October 12

Source : U.S. Weather Bureau, Climatological Data
Washington

Table 8.- Temperatures at Dayton, Columbia County
By Monthly Averages

Station and Elevation in Feet	Average Temperatures (in degrees Fahrenheit)												Annual Average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Dayton (1,610)	31.9	36.2	43.0	50.4	57.3	63.0	70.4	69.0	62.1	52.2	40.3	35.2	50.9

Source: U. S. Weather Bureau, Climatological Data, Washington, Annual Summary, 1956

Forests and Other Land Resources

Southern Columbia County contains important forest resources in the Blue Mountain region. Over 150,000 acres of timber are federally owned in Umatilla National Forest. Farmer or privately owned woodlands and woodland pastures amount to about 39,000 acres. State owned timber and grazing lands amount to 11,500 acres. Important commercial timber species are Ponderosa pine, making up about 75 percent, while Douglas fir, western larch, lodgepole pine and Engelmann spruce make up the remainder. Most of this timber resource is managed by the U. S. Forest Service. In recent years the commercial sawlog cut in the county has been 7,500,000 board feet per year. Lumbering is an important adjunct to agriculture.

The mountain land is valuable for multiple uses such as cattle and sheep grazing, watersheds and recreation for campers and hunters. In a recent hunting season the wild elk herds at the sources of the Touchet and Tucannon Rivers yielded 440 elk. The wild deer kill was 1,200 head. Columbia ranks among the first five counties of the state in big game hunting. In addition, its grain croplands and woodlands yield over 4,000 pheasants per season according to Washington State Game Commission reports. Primitive areas also yield important catches of fur bearers such as muskrats, mink and marten.

Table 9.- Columbia County's Rank Compared With Other Washington Counties

Item Compared	Rank	Quantity	Year
General			
Land area	31	550,400 acres	1954
Number of farms	35	356 farms	1954
Land in farms--percent	10	61.6 percent	1954
Average size of farms	8	952 acres	1954
Cropland harvested	12	114,856 acres	1954
Rural farm population	33	1,520 persons	1950
Total county population	34	4,860 persons	1950
Cash farm income			
Value of all farm products sold	18	9,389,734 dollars	1954
Value of livestock sold	36	627,489 dollars	1954
Value of crops sold	12	8,731,484 dollars	1954
Livestock on farms			
All cattle and calves	28	11,650	1954
Milk cows	38	498 head	1954
Hogs	25	1,394 head	1954
Chickens	35	12,782 birds	1954
Horses and mules	26	496 head	1954
Sheep and lambs	25	1,199 head	1954
Dairy and poultry products sold			
Value of dairy products sold	37	34,616 dollars	1954
Whole milk sold	36	474,000 pounds	1954
Value of poultry products sold	36	38,826 dollars	1954
Chickens sold	36	4,395 birds	1954
Eggs sold	36	63,003 dozen	1954
Important crops harvested			
Wheat	11	75,214 acres	1954
Alfalfa	24	1,841 acres	1954
Vegetables	3	15,996 acres	1954
Fruits	24	328 acres	1954

Sources: U. S. Census, Agriculture, 1954.
U. S. Census, Population, 1950.
Washington State Census Board Estimate 1955.